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Vol. 65, No. 40, Pages 729-744

October 2, 1984

6970 Structure of the Crust and Upper Manile (Sefsmology)
DEEY BASEMORT SSISMIC REFLECTION PROFILMS OF THE FUNCTIL
ANTICLEMORIUM USING A LAND AIR OWN SOUNCE
7.A. Cook | Department of Geology and Coophysics,
University of Galagry, Calgary, Albarts The 184)
Salamic relisation profiling in the Furcell enticlinorium of southern Stitish Columbia, Camele unity a
land afr gun source has revealed teffsetions from depths
of at least 18-30 k(fometers. Interpretations of these
date, in tonjunction with related geological and geophysical information, couldes the allockthomous structure
of the Furcelf anticlinorium and suggest that autoribhonoum North American beassmont of 15-20 k(Insmisse depth
beneath she outleitnorium has a westward dip of 15-29°.
The thickness of the crust shove the North American
beassmont surface asy he stronomated by structural and surface day be atcome ion of Potcell strate, by threat elicas of North hmarfces basanent route, or by both. The geometry basarved on the restaction dets (mpiles the Purcel) Mildifoutium is coted by a grantal-stale thrust with the basalow and the second states of the second ont(cfies thanging wall onticline). Further, the dat, lemonstrate that land olt gums are affectles soutces i crustal teffectfon work. (Setamic methods,

J. Comphys. Res., B. Paper 481179. .

6979 Strutiure of the Upper Mantle THE DEPTHS OF THE DEEPES BEEP EARTHQUARES Philip S. Start and Cliff Frontich | lettitute for Geophysics, The University of lexae at Autila, Austin, lexae, 2871

The mesimum depth of salests activity is a fundamental observation providing a tendreint on models of martia dysamiss. Although resent investigations of martia calmaisity and dynamics generally tisis that teisually salests to "about 700 km," targe marthquisket with focal depths of 720 km have been reported, as have that it wents uith depths extending 200 km, Ma have enamined fatel depths of events in several satings and sonctuded that the deepest events with reliable focal deaths against sinking and several actings and sonctuded that the deepest events with reliable focal deaths against sinking him, and accepts with farsi The mesium depth of seisuic activity is a fundasoncluded that the deepet events with reliable focal depths accur at about \$70-500 km, and events with fecal depths accur at about \$70-500 km, and events with fecal depths exceeding 500 km occar in saveral utdely separeted geographic regions. Events with reported focal depths exceeding 500 km generally possess inconstatent observations, ar very few observations. The termination of seismic activity beneath about \$50 km is quite abrupt. However, we cannot determine whather the saw imme size of events determine whather the saw imme size of events determine the same size of events determined by the same size of events determined by the same size of events determined to be set and \$55 km, etc. Several models wen emplish the absence of setsmic activity in the lower mantive. Two models are consistent with both the abrupt termination of ectivity and its occarrence of shoul \$50-500 km in uidefy saparated geographic regions. These are a sitter a barrier which resists penetration of the subducting lithosphere, or e phase trensition which modificat the propertial of the subducted manting as it goes into the lower mantle. (Deep aarthquekee, mastle convection)

. Geophys. Res., B, Paper 425049. Social Sciences

7310 Ecosolics SCIECTICES
7310 Ecosolics SOLAR RUENCY AND HYDROFLECTRIC POWER CEMERATION IN THE OEAD SEAL A DYNAMIC ANALYSIS B. Bochman, J. LaFronces Department of Agilcultural Economics and Economics and Economics and Economics and Economics and Economics and Economics of the Solar A dynamic optims f control model 1s daysloped for enearsting bydroal entite power to the Deed Sas. Properties of the optims futilization path and escady state squilibria are anniysed, and the applicability of the model for other types of water deasiopsent projects is discoseed. Estimates of the beefs equations for the Dead Sas project and a monarisal applicability and projects of the Dead Sas project and a monarisal applicability and projects of the Dead Sas project and a monarisal applicability and projects of the Dead Sas project and a monarisal applicability and property of the Power of the Powe

/310 Economics EX-POST EVALUATION OF FLOOD CONTROL INVESTMENTS: a CASE STUDY IN NORTH DAKOTA
K. 7sisnisami (Department of Agticultures Sconomics,

K. 7sianiami (Department of Aglicultuesf Sconomics, Tamif Madu Agricultural University, Coimbatomo, 64f833, lodis) and K. William Seater
Ex-post estimates of a flood control project in Mortb Dabats are compared with the Corps of Suglassas sx-once satismass. Hiesty-two percent of the ex-sate benefits were supposed to come from water supply sed the rast item flood control. Seased on 32 years of data, the ax-post satismass showed serv water supply benefits and flood costrol benefits 37 times higher thom ax-more satismass. thon as annexes attents. These adds flood control benefits resulted from an increased frequency of flooding beginning with the first two years of the project's operation. Thouly the sweper anelysis found that commerciaf fishing and rectantion bonelit accounted for 28 accounted the statement of the statement of

Water Resour, Cos., Peper \$4116b.

Solar Physics, Astrophysics, and Astronomy

7718 Corona CMARACTESISTICS OF CORONAL MASS EJECTIONS ASSOCIATED WITH SOLAR FRONT-SIDE AND BACK-SIDE METRIC TYPE IL SURSTS
S.W. Kahlar | AFGL/Pap, Hensson AFA, MA, 9(731), E.W.
Cliver, M.R. Sheeley, Jr., S.A. Howard, M.J. Koomen,
and S.J. Hishela

We compare feat | v > 500 km·s⁻¹ | soremel meas
ajections (CMEL) with reported matric type II bursts
to study the properties of CMEE associated with
coronal shocks. Ma sonfirm as earlier report of fatt
front-side CMES with no associated metric type II caronal stocks. We son'time associated with caronal stocks. We son'time a earlier report of fact front-side CMEs with no associated metric type it bersts and calsulate that 33 ± 55s of all fess front-side CMEs are not associated with such bersts. Front-side CMEs are nor sikely to be associated with lype it bersts, as espected from the Appothecis of platon-driven shocks. However, CME brightness and associated peak 3 ca berst latansity are also important factors, as might be inferred from the Magner and MacQuase [1983) var of type It thocks decoupled from associated CMEs. We use the equal visibility of aciar front-side and back-side CMEs to deduce the observability of beck-side CMEs to deduce the observability of beck-side type It bersts. We calculated with fast CMEs can be observed at Earth, and that (3 > 4% of all type it bartts originate in laportant fastor in the observability of back-side type It bersts. [Corona, flares].

J. Seophys, Rus;, A. Puper 4A8130.

Tectonophysics

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WIDER AND ADJACUST EMPIONS

M. E. F. SOLS (Seperiment of Geological Sciences,
Octuverity of Durham, Secto Road, Durham SHI ILE, s.e.!

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SOURCE MECHANISMS OF EARTHQUAKES MEAR MID-CLAM MINES SOURCE MECHANISMS OF EARTHQUAKES MEAR MID-CLAM MINES FOR THOU HOND MAKEFURN INVESTIGN. IMPLICATIONS FOR THE LEVOLUTION OF OCCANIC LINUSPHEME Eric A. Bergman and Sour C. Solomon | Dept. of Earlh, Almospheris, and Pienetary Sciences, Massachuells Lesitute of Technology, Cabridge, MA 02139) to lawestigate the early tactonis evolution of canditations are reported to the same of the characteristic ser apartiage warthquatet, i.a., earthquates which tics of apartiage warthquatet, i.a., earthquates which tics of apartiage and apartiage series but in ithosphers less than 35 m.y. etd. Mear-tige but in ithosphers less than 35 m.y. etd. Mear-tige but in ithosphers less than 35 m.y. etd. Mear-tige but in ithosphers less than 35 m.y. etd. Mear-tige warthquatet to datades has Dear-tide and the semination of the control indiae Occan and the state the exception of the central indiae Occan and the state of earthquakes, we datamined the doubt capit maar-tidge earthquakes, we datamined the doubt capit mear-tidge earthquakes about the function, using a format leversion technique that the function, using a format leversion technique that the function is contacted to the second that the function selection is contacted to the second that the function of the second that the function of the second that the function is a second to the second that the function of the second that the function of the second that the second that the function of the second that the sec the function, using e format loversion technique section on matching synthatic and ebserved P and Si serviciff. On matching synthatic and ebserved P and Si serviciff. All types of fartiling styles are observed. Salmopeic deformation in young oceanic lithosphara is contentived deformation in young oceanic lithosphara is contentived in the first is m.y., and accurs almost antiriy is but in the first is m.y., and accurs almost antiriy is but in the first is m.y., and accurs almost antiriy is with the first is m.y., and accurs almost antiriy is with the search of the depths greater than in its below the search of the normal-feuriting four mechanisms, with the laris which normal-feuriting four mechanisms characteristic of the near-riog environment of the earthquists eccur in the central indise States of these earthquists eccur in the central indise States of these earthquists eccur in the central indise States of these earthquists eccur in the central indise States when the conting and tubaldence of the execution of the search of the conting and tubaldence of the interpolate that the conting and tubaldence of the essentiated with the conting and tubaldence of the unitary in the search of the place a lower bound of several result may be used to place a lower bound of several result may be used to place a lower bound of several result in the casalle tithosphare. This bound, together with the casalle tithosphare. This bound, together with the casalle tithosphare. This bound is pertial to the same defermation is intelly at same account for the meabonisms and depths propriat roll the second of the earth unitary and the place conting play an important roll the second of the casalle that are set the second of the continuent of activity of the casalle servate way replete the concentration of activity of the relation of the continuent of the second of the second of the earth of the second of the casalle of the second of the casalle of the continuent of the second of the earth of the second of the casalle of the second of the

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News

Long-Range Space Objectives

At the request of the National Aeronautics and Space Administration (NASA) the National Research Council's Space Science Board has undertaken a special study of the long-term (post-1985) objectives of U.S. research in the space sciences. The study will continue over approximately 2 years and will involve two to three summer sessions as well as disciplinary group meetings during the intervals between the summer sessions. This special study is intended to build upon and considerably extend the strategy reports in the various space science disciplines that the board has been involved in formulating over the past few years.

In the first meeting of the entire study, held at Woods Hole, Mass., August 20-29, each of the disciplinary panels formulated a draft report on the present status of their sciences and the expected space science missions to the year 1995. These expected missions are based upon the science strategies as contained in the reports of the several committees of the Space Science Board. The individual task groups also developed, in a very pre-liminary fashion, scientific objectives and space science missions that might well be considered for implementation in the post-1995

The study is organized around a steering group and is heing conducted by this steering group plus six disciplinary panels, consisting of approximately 12 individuals each. Present membership of the steering group includes T. M. Donahue (Chairman). University of Michigan; D. Anderson, California Institute of Technology; R. Berliner, Yale; B. Burke. Massachuscus Institute of Technology; A. G. W. Cameron, Harvard; H. Friedman, NASA; D. Humen, University of Arizona; F. Johnson, University of Texas, Dallas; S. M. Krimigis, Applied Physics Laboratury/Johns Hop-kins University; E. Levy, University of Arizona; F. B. McDonald, NASA; L. Margulis, Boston University: J. Naugle, Fairchild In-dustries: F. Scarf, TRW; E. Stone, California Institute of Technology; S. Swisher, Michigan State University; J. A. Van Allen, University of lowa; and R. Weiss, Massachusetts Instithe of Technology. The chairs of the disci-plinary panels are R. Weiss (Fundamental Physics and Chemistry). D. Hunten (Planetary/Lunar Exploration), B. Burke (Astrononiy/Astrophysics), D. Anderson (Earth Sciences), F. Scarf [Sular/Space Plasmas), and L. Margalis and S. Swisher (Life Sciences).

Objectives of the task groups during the next year will be the continued definition and refinements of the long-term space science objectives and possible mission models on the basis of the expected positions of the various disciplines in 1995 as discussed in the past board strategies. In the next year there will also be concerted efforts to discuss widely within the individual constituent scientific communities the activities of the task groups and the planning processes that are nagoing There is every intent to involve as wide a spectrum of the scientific community as pussible in order in ensure that the very best ideas are considered for the pust-1995 space science objectives of the nation.

This news item was contributed by L. J. Lanzerotti, Bell Laboratories, Murmy Hill, N. J.

APEX: The Arctic Polynya Experiment

A field experiment has been initiated to address the mesoscale oceanographic, sea ice, and meteorological processes associated with a polynya, or high-latitude area of semiperwater and vigorous new ice growth. This experiment, called the Arctic Polynya Experiment (APEX), is taking place in and around the St. Lawrence Island Polynya on the northern Bering Sea shelf. This po-lynya was selected for study because it typifies many such features found throughout the Arctic and Antarctic, ia relatively accessible, and lies in a region that is of considerable in terest due to projected resource develop-

A polynya is an open water area which persists despite environmental conditions which

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would seem to dictate formation of an ice cover. Such areas may be due to a variety of causes. The majority appear to occur, however, when a physical barrier, such as a coastine or a channel constriction, allows prevailing winds or currents to sweep newly formed iee away while at the same time preventing existing ice from moving into the area. The St. Lawrence Island Polynya occurs along the outhern, or lee, coastline of St. Lawrence laland as the prevading northerly winds sweep iee away toward the south. Polynyas are of oceanographic interest because they are sites for vigorous, continuous ice formation and are therefore sources both of new ice and of dense, brine-euriched water. They are of interest meteorologically because the associated strong sea-air heat fluxes modify the atmospheric boundary layer.
Oceanographic goals of the APEX program

include estimation of the mesoscale heat, salt, and momentum fluxes associated with a polynya and definition of the dynamics which affect these fluxes. These goals will be addressed through time series current, tem-perature, and salinity observations obtained from oceanog raphic moorings. The data analyses will focus upon polynya-associated dynamics within the context of a coastal ynamics problem and will use descriptive analyses and simple analytic motlels. Goals of the APEX sea ice studies include estimation of ice formation rates and of the effects of he polynya on regional ice properties and lynamics. Field observations of ice motion will be obtained by using satellite-tracked drift buoys, and ice distribution will be observed will satellites. The analyses will integrate the observed ice distribution and motion with oceanographic and meteorological conditions through a numerical model. Meteorological program goals include estimation mesoscale and boundary laver effects associated with the polynya. Meteorological con-ditions will be monitored by using remote recording and satellite transponding weather stations. The data will be analyzed in conjunction with computed regional winds in ad-dress the above goals.

The oceanographic moorings are presently in place, having been deployed in early Octo-ber 1984 from the University of Alaska vessel Alpha Helis. It is planned that these moorings will be recovered using the same vessel, in May 1985. Metcorological stations and ice drift buoys will be deployed in February 1985 from a NOAA helicopter operating out of Nome, Alaska. The experiment is funded ointly by the National Science Foundation. the Office of Naval Research, and NOAA.

This news item was contributed by Robin D. Muench, Science Applications International Corp., Bellevue, WA 98005, and Carol H. Pease, Pacific Marine Euriroumental Laboratory, NOAA, Seattle, WA 98115.

Exclusive **Economic Zone**

Following President Reagan's declaration of an Exclusive Economic Zone (EEZ) in March

1983, the National Advisory Committee on Oceniis and Atmosphere (NACOA) undertook a study to begin sorting out what impli-cations the proclamation would have on existing and future oceans legislation and policy.

As a result of this proclamation and the Reagan administration's earlier decision not to sign the Law of the Sea (LOS) Treaty, much discussion has centered around whether or not the United States should attempt to formillate a comprehensive package containing all oceans-related legislation. According to the NACOA report "The Exclusive Economic Zone of the United States: Some Immediate Policy Issues," most experts argue against such a move. NACOA agreed, recommend ing that a comprehensive oceans package is not needed nor even desirable at this time Instead, NACOA argues, emphasis should be placed on assuring that existing U.S. ocean policy is "consistent" with the nondeep seabed provisions of the LOS treaty. NACOA is a Presidential advisory committee that conducts ongoing reviews of national oceanic and atmospheric policy and reports direcdy to Congress and the President.

Another major NACOA recommen called for a clearly defined system for dispute xettlement, particularly regarding freedom of navigation through other nations' exclusive economic zones. In order to assure navigational freedoms, NACOA recommend the United States should not implement any policy that goes beyond those provisions of the LOS treaty. Although disputes cannot be totally avoided, NACOA admits, a system of dispute settlements set up and agreed upon beforehand can help the United States reach timely agreements with odier coastal nations, This may be particularly important, says NA-COA, because existing treaties with coastal nadons leave many gaps where disputes could

A final major NACOA recommendation. now being acted upon, is to conduct a de-

tailed "nuts and bults" study to determine what implications the EEZ proclamation will have on existing U.S. legislation. The Onter Continental Shelf Lands Act of 1953 is a prime example. The Committee nn Atmosphere and Oceans (CAO), a separate niganization, is in the process of completing this re-

port, which is due sometime in November. In related news, NACOA has received funding of \$630,000 through the end of fiscal year 1985, which began October 1. For the past several years the Reagan administra-tion has attempted to eliminate NACOA hy cutting its funding, but Congress, as was the case this year, has always intervened.—DWR

NRC Associateships Available

The National Research Council (NRC) has announced that some 2500 new full-time associateships will be awarded in 1985 for research in the sciencea and engineering. Most of the positions are open in both U.S. and non-U.S. natinnals and to both recent Ph.D. holders and senior investigators. Applications must be postmarked an later than January 15, 1985. The announcement of initial

awards is expected in March and April 1985. The associateships will be awarded on a competitive basis for research in chemistry. engineering, and muthematics and in the earth, environmental, physical, space, and life sciences. More than 20 federal agencies or research institutions located throughout the United States will participate.

Most of the awards will be made for 1 ar 2 years. Applicants who have held ilocturates for at least 5 years may request shorter ten-nres. Stipends beginning at \$25,350 per year fur reccut Ph.D. holders will be awarded. A stipend supplement of up to \$5,000 may be available to regular awardees who hold recognized Ph.D.'s in disciplines which full significantly below the current demand of U.S. graduate schools. Last year these disciplines included engineering, computer science, and space-related binmedical science.

Further information, including applications, specific research opportunities, and iederal laboratories participating, is available from Associateships Programs, Office of Scientific and Engineering Personnel, 111 608-D3, National Research Council, 2101 Constiiution Avenue, N.W., Washington, DC 20418 (telephone: 202-334-2760).

Upcoming Hearings in Congress

The following hearing has been tentatively scheduled by the House of Representatives. The date and time should be verified with the case and units should be verified with the committee or subcommittee holding the hearing; all offices on Capitol Hill may be reached by telephoning 202-224-3121. For guidelines on contacting a member of Congress, see AGU's Guide to Legislative Information and Contacts (Eas, August 28, 1984, p. 669).

October 10. Field hearing on U.S. ocean policy by the Subcommittee on Fisheries and Wildlife Conservation and the Environment of the House Merchant Marine and Fisheries Committee. Versailles Room, New Orleans Hilton Hotel, 2 Poydras St., New Orleans, La., 9 A.M.—BTR

NASA Guest Investigators

The National Aeronautics and Space Administration (NASA) is now seeking guest inrs to participate in the International Sun-Earth Explorer (ISEE) and International Cometary Explorer (ICE) programs. The ISEE/ICE project is a joint NASA/European Space Agency (ESA) venture. A budget of approximately \$500,000 to support the ISEE/ ICE Guest Investigator Program is expected for fiscal year 1985, and a similar amount is expected for FY 1986.

Although NASA welcomes proposals at any time, proposals must be received by mid-Oc-tober in order to be considered in the initial selection. Those arriving after mid-November may be held for another selection period.

NASA's objective is to extend ond augment established ISEE/ICE programa. Participation and use of data may take several forms. Researchers may use data already collected or plan special operations for future data acquisition and interpretation using program in-struments that are already operating. In addition, theoretical Interpretive studies in support of specific experimental results from ISEE/ICE may be conducted, as well as comparative studies combining data from another source with ISEE/ICE data.

Queations regarding this guest investigator program should be addressed to John T.

Lynch, Code F.E., NASA Headquarters, Washington, D.C. 20546 (telephone: 202-453-1676). Queries specifically regarding comet science only should be sent to William Brunk, Code EL, NASA Headquarters, Washington, D.C. 20546 (telephone: 202-453-1596).

Space Station Proposals

NASA has issued a request for proposals (RFP) for definition and preliminary design of a permanently manned space station. The station is to be operational in low earth orbit early in the 1990's. According to NASA, the station will "aupport scientific and commercisl endeavors in apace, stimulate new technologies, and enhance space-based operational capabilities." Proposals are due November 15, 1984.

Intended to be operational for several decades, the apace station will include a number of pressurized modules and a power aupply of 75 kilowatts, will support a crew of six to eight people, and will have two or more free-

flying unmanned platforms.
The RFP includes four "work packagea" covering preliminary designs of space station elements. Contracts to be let in each package are scheduled in begin April 1, 1985. The RFP also requires contractors to atudy the possibility of using automation and robotic

technologies.

Final design and development of the station will begin in 1987. Overall system engineers will be perneering and integration activities will be per-formed by NASA's Johnson Space Flight Center, Houston, Tex.

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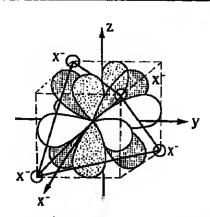


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Mineral Physics News



The focal point for the mineral physics community. Editori Robert M. Hazen, Carnegie Institution of Washington, Geophysical Laboratory, 2801 Upton Street, N.W., Washington, DC 20008

What is Mineral Physics?

In the past the principal task of the miner alogist was simply to describe and classify physical, chemical, and structural properties of the remarkable variety of natural inorgani crystals. As this task was grachially accounplished for most species, however, mineral-ogists increasingly sought to identify physical and chemical principles that underly mineral formation and behavior and procedures that night lead to predictions of stability and properties of phases deep within the earth. Mineral physics, which has evolved during the past 2 ilecades, is thus the struly of mine alogical problems through the application of the principles of condensell-matter physics

Mineral physics bridges gaps among a number of disciplines. Mineral physics is closely linked with traditional earth-science fields, including solul earth geuphysics, geochemistry, crystallography, petrology, ar crystal chemistry. Close ties also exist with topics in reramics, materials science, physical clientistry, high-temperature and high-pressure research, and solid-state physics. The range of materials studied parallels the diversity of minerals themselves: elements, metal alloys, sulfides, halides, layer compounds. and zeolites, in addition to rock-forming oxides and silicates, have been the focus of much study. Experiments on minerals and their analog compounds have intensified as new industrial applications have been found in the manufacture of lasers, high-performance ceramics, molecular sieves, catalysis, and a wide variety of electronic components.

The methodology of modern mineralogy, both experimental and theoretical, reflects the new objectives of mineral physics. A majur focus for many mineral physicists is the precise determination of the physical constants of minerals. Shock-wave and static compression experiments, coupled with measurements of thermal expansion and other properties, are used to calculate equations-ofstate for minerals. Ultrasonic and Brillouinscattering experiments yield the elastic moduli of crystals. Other researchers measure thermal conductivity, electrical conductivity, and magnetic properties of minerals.

In addition to well known rieutron, X ray and opulcal microscopic methods of the mineralogist, mineral physicists have adopted a wide range of spectroscopic procedures that reveal asperts of the structure and composition of minerals. Mossbauer, optical, and nuclear magnetic resonance spectroscopy probe the atomic environment and electronic state of ions in crystals. Raman and infrared spectroscopy reveal the molecular and lattice vibrations of mineral crystals. Microprobes that employ beams of electrons, X rays, and ions have led to ever more precise and spatially

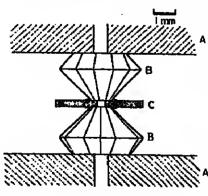


Fig. 1. The diamond shvil pressure cell is an important tool in mineral physics re-search. Static pressures up to 2.75 Mbars have been attained in studies of mineral

been enhanced by the application of transmission electron microscopy, which has revealed unnperiodic aspects of crystals includ ing defects and stacking disorder. Quantitative thermochemical techniques, in particular a variety of calorimetric procedures, provide critical data no the internal energies of minerals. These experimental studies are complemented by computational quantum chemis-try, which has led to predictions from first principles in a few simple cases of mineral

structure, stability, and physical properties.
Concurrent with the application of these and other new mineralogical techniques has been the remarkable derelopment of highpressure and high-temperature apparatus for the measurement of mineral structures and properties at geologically-relevant conditions. Progress in diamond-anvil pressure cell technology (Figure 1) and applications of laser heating, in particular, have become major efforts in the mineral physics community.

Underlying much of the mineral physics research is a growing awareness of the dependence of macroscopic properties—particularly those structural and transport properties that influence geophysical behavior atomic-level interactions. A major effort, therefore, is underway to document Interrelationships among minemi structure, bonding, physical properties, and stability. Such an un-derstanding of minerals will inevitably lead to a more complete understanding of the struc-ture and dynamics of the earth's interior.

Information Report

The Mineral Physics Committee

Mineral physics is a diverse field that includes the study of crystal structure, thermoclientical properties, physical properties, equations of state, and phase equilibria of minerals and mineral analog compounds. All of these mineral parameters are interrelated. yet they have been traditionally studied and reported by members of different AGU sections. Equations of state and elastic constants are usually included in Tectonophysics, magnctic properties of minerals are often treated in Geomagnetism and Paleomagnetism, and crystal strutture and phase equilibria routine ly appear in sessions of Volcanology. Geo-chemistry, and Petrology. Other subjects of interest to the mineral physics community may be reported in Oceanography, Planetol ogy, or Seismology. As a result, many closely elated topics have been presented in ronflict ing sessions at AGU meetings. The estent of this problem was highlighted during the 1983 Spring AGU meeting, when at one point aspects of silicate mineralogy and petrology were discussed concurrently in seven different sessions are never the first 1985. ent sessions sponsored by five different sec-

The AGU Executive Council approved the establishment of the AGU Committee on Mineral Physirs in March 1983 and charged the Committee to "provide service to the AGU and to the mineral physics scientific nunity." President Van Allen approved the appointments of Orson Anderson as chairman, and members Peter Beil, Raymond leanloz, Robert Liebermann, Murli Manghnani, Tom Shankland, Tom Ahrens, and Joseph Smith. The latter two members served ex officio as offirers in the Tectonophysics and VGP sections, respectively.

The first meeting of the newly established Committee was held at Baltimore, Md., May 31, 1983, and subsequent meetings occurred at San Francisco, Calif., on December 7, 1983, and In Cincinnati, Ohio, on May 15, 1984. One of the Committee's first activities in addition to coordinating meeting sched-ules, was to compile a list of mineral physics workers in order to identify the range of interest in mineral properties. This list rapidly expanded to more than 300 scientists in 20 countries, and it soon became evident that, just as mineral physics extends beyond the traditional bounds of any one AGU section, so also does it extend well beyond the srope of the earth sciences. Workers in ceramics, solld state chemistry, material science, and theoretical physics are regular contributors of significant results with direct applications to geophysical problems, yet many of these results are not known to AGU members. An expanded role for the Mineral Physics Committee was thus proposed. In addition to the original task of coordinating related AGU meeting sessions and other activities, the Mineral Physics Committee now seeks to foster links among all the diverse elements that ramprise the mineral physics community.

Complete activities thus include the organization of symposia, the development of a mineral physics monograph series, the active solicitation of mineral physics articles for AGU nericulians, and the distribution of mineral physics. AGU periodicals, and the distribution of a

newsletter to die international list of researchers in mineral physics.

Under the chairmanship of Orion L. Anderson, Professor of Geophysics at the Uni-

versity of California, Los Angeles, several panels have been organized to undertake the activities of the Mineral Physics Committee. The AGU Sessions Program Panel (William Sassett, Charles Prewitt, David Kohlstedt, Charles Sanimis, and Steven Kirby) is respor sible for coordinating mineral physics abstracts in an effort to minimize conflicts between presentations of interest to the mineral physics community. As a first step it is recontmended that contributors designate "Mineral Physics Sessinn" on abstracts submitted to AGU meetings. This notation will ensure the inclusion of the paper in an appropriate ses-

The Panel on Conferences and Publications (Alexandra Navrotsky, Donald Weidner, Tom Shankland, and Harve Wall) has examined the possibility of a new AGU monograph series on aspects of mineral physics. It anticipated that the first titles in this series will be announced shortly. The panel is also considering possible topics for Chapman con-

The Membership and Publicity Panel (Robert Hazen, Earl Graham, Sue Kieffer, and Leon Thompson) is charged with the task of developing and maintaining a mailing list and with communicating news of interest to the mineral physics community. A growing list, expanded to more than 500 scientists from 30 countries, has been prepared. Requests for sets of pre-gunimed labels for appropriate mailings will be considered by the panel. News will be communicated both through pe riodic "Mineral Physics News" sections of Eos, and through mailings to the entire list of mineral physicists, sponsored by a grant from the AGU Council. In this way, AGU will provide the much-needed headquarters for the diverse international mineral physics commu-

The Pancl on Long-Range Future of Mineral Physics (Orson Anderson, Peter Bell. Murli Manghnani, and Joseph Smith) has reported on the prospect of augmented federal research funding in mineral physics. A Na-tional Research Council (NRC) Panel on the Solid Earth identifed "physics and chemistry of earth materials" as one of "five research areas in which significant dividends can be expected as a result of incremental federal investment in FY 1985." Members of the panel will continue to seek opportunities to act in roncert with NRC and agency officials to bol-

ster the long-term future of mineral physics. Other participants in the Mineral Physics Committee include the Nominations Panel (Roger Burns, Daniel Weill, and Hartmut Spetzler), Foreign Secretary (Robert Liebermann), Committee Secretary (J. Michael 8rown), and AGU Section Liaisons to Tectonophysics (Tom Ahrens), to VGP (Joseph Smith), and to Geomagnetism and Paleomag netism (Subir Banerjee). In addition to the original members of the Committee on Mineral Physics, two new members, Roger Burns and Alexandra Navrotsky, have been added.



Orson Anderson, Chairman

News & Announcements

Call for Mineral Physics Papers

(GRL) are attempting to increase submission rates in the fields of solid earth geophysics, and in particular in mineral physics. GRL, which is noted for its rerord of rapid publica tion, welcomes short, original articles of new results presented in a way that will make their significance apparent to the general geophysics community. Manuscripts should be sent to James C. G. Walker, Editor, Geophysical Research Letters, 2455 Hayward, Ann Arbor, MI 48109.

Mineral Physics News: Call for Contributions

Mineral Physics News will appear biannually

News, notes, reviews, or other material of general interest to AGU and the mineral physics community are welrome. Please send information to the editor of Mineral Physics News. The next cilillon of Mineral Physics News will be published in April 1985. The deadline for copy is February 28, 1985;

Meetings

Developments in High-Pressure and High-Temperature

The Mineral Physics Committee, Tectonophysics Section, and die VGP Section plan a special session for the Full 1981 AGU meeting in meninry uf Julin C. Jamieson. The seswill be devoted to recent advances in the areas in which John worked and will include an invited talk on his contributions to geo-physics. Additional invited papers by Mudi nghnani, William Bassett, Robert McQueen, and Buzz Graham, reviewing high-pressure crystallography, shock-wave work, and general high-pressure techniques will complement the contributed papers. A special issue of the Journal of Geophysical Re-search-Solid Eorth is being planned consisting of papers from this session. For further in-formation contact Phil Halleck, 442 Dieke Building, Pennsylvania State University, Unirersity Park, PA 16802 (telephone: 814-863-

High-Resolution Electron Microscopy

As part of the celebration of the centennial of Arizona State University there will be a symposium on high-resolution transmission and analytical electron meroscopy from January 7-11, 1985. The goals are to review and evaluate developments in theory, techniques, and application that have been made to the present; and to evaluate new research directions that will arise from the next generation of instruments and techniques that are now becoming available. For further information contact Centennial Symposium, Center for Solid State Science, Arizona State University,

Microscopic to Macroscopic

A short course will be held immediately prior to the Spring 1985 AGU meeting on relations among thermodynamirs, lattice ribrations, coordination geometries, and bonding in minerals. Many aspects of mineral physics. including spectrosropy, crystal chemistry. thermochemistry, phase transitions, and bonding will be integrated in an effort to demonstrate the close correlations between atomic-scale and macroscopic properties of minerals. The Mineralogical Society of America short course is primarily pedagogic in oature, and it is planned to complement that emphasis with a series of research presentations at an nll-day symposium of the same title at the 1985 Spring AGU meeting. For more information contact Susan W. Kieffer, U.S. Geological Survey, 2255 North Gemini Drive, Flagstaff, AZ 86001.

Quantum Theory and **Experiment Applied** to Solids

Planning is now underway on a 5-day symposium to review developments in the de-scription of structure and bonding in perfect crystals. This conference, which is to be held May 1986 at the University of Maryland, College Park, is in some ways a sequel to the successful conference on Structure and Bonding in Crystals, which was held at Casde Hot Springs, Ariz., in 1980. Discussions will include experimental and theoretical aspects of small gas molecules relevant to understand-ing solids, defect solids and glasses, oxide suraces, and solution and gel species impor in natural waters. For information contact Jack Tossell, Department of Chemistry, University of Maryland, College Park, MD 20742.

Mineral Physics Symposia

There will be one or more mineral physics symposia at the next International Mineralgical Association (IMA) meeting, July 13-18 ogical Association (IMA) meeting, July 1986. Anyone wishing to organize or participate in an IMA symposium should contact. Larry Finger, Geophysical Laboratory, 2801 Upton St., N.W., Washington, DC 20008.

Do you know a colleague who would like to join AGU? Call 800-424-2488 and request membership applications...

Books

Proterozoic Geology

L. G. Medaris, Jr., C. W. Byers, D. M. Mickelson, and W. C. Slianks (eds.), Mem. 161, Geological Society of America, 315 pp., 1983,

Reviewed by P. K. Sims

This book and its rompanion, Early Protero-wic Geology of the Great Lakes Region (Mem. 160 Geological Society of America, 1984), edited by L. G. Medaris, Jr., are the products of an International Proterozoic symposium held at the University of Wisronsin, Madison, May 18-21, 1981. This volume contains 23 papers that present the current thinking of experts on many aspects of Proterozoic evolution of the earth; it is divided into five broad categon'es: tectonics, magmatism and metamorphism, mineral resources, evolution of life and the atmosphere, and glaciation.

The Proterozoic is a distinctive interval in

the geologic history of the earth, encompssing the transition from Archean conditions to those of the Phanerozoic. By Early Proterozoic time, extensive stable continental plates existed, and deformation, deposition, and intrusion styles were comparable to those of today. Also, the amount of free oxygen in the atmosphere and hydrosphere continuously increased during the Proterozoic and eventually reached levels supportive of metazoan evo-

The Early Proterozoic is characterized by thick epicratonic sedimentary sequences and oceanic-arc volcano-plutonic compleses, which are variably deformed. What tectonic processes were operative during this interval of time is a matter of rontroversy. The case for Wilson-cycle signatures analogous to modern plate tectonic regimes is presented by Brian Windley, who points to the well-exposed and well-documented Wopmay orogen n northwest Canada as an excellent esample. In contrast, A. Kroner and A. J. Baer argue for ensialic orogens. The uniformitarian view

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favors Wilson-cycle orogeny, but is it possible that Proterozoic mobile belts underlain by gneisses developed as a result of tectonic pro cesses unique to die Proterozoic (and Arche-

Oxidation of the atmosphere during the Proterozoic is rerorded in the rocks by changes in the nature and type of sedimenta-tion, mineral deposits, and life forms. The interrelation of Proterozoic life, air, water, and sediments through time is ably reviewed by P. E. Cloud. Proterozoic chemical sediments are depleted in ¹⁸O with respect to Phanerozoic analogues, and E. C. Perry, Jr., and S. N. Ahmed propose that the sediments were precipitated from a Proterozoic ocean depleted in 15O. Others have proposed that the depletion resulted from a hot Proterozoic orean. As an example of the change in the types of mineral deposits with an evolving atmosphere, J. J. Langford discusses the differences between the Early Proterozoic gold-uranium paleoplacers and the younger Proterozoic, highgrade unconformity-type conrentrations. Ex-halative massive-sulfide deposits, which formed most abundantly in the Early Proterozoic, are described by G. H. Gale; and another important deposit type, sediment-hosted lead-zinc deposits, is reviewed by I. B.

In a significant paper, S. R. Taylor and S. M. McLennan show that clasue sedimentary rocks record the fundamental change in m ma chemistry from relatively sodic Archean rocks to more potassic Proterozoic rocks. They demonstrate that rare-earth-element patterns are remarkably uniform in post-Archean sedimentary rocks and conclude that this reflects reworking of older crust. Another distinctive aspect of Proterozoic magmatism was the generation of anorogenic anorthosite, rapakivi granite, and ignimbrites in the interval 1,800-1,000 Ma. J. L. Anderson summarizes a large body of data on these igneous rocks and argues for an origin by fu-sion of lower crustal material in commental rift environments. F. J. Sawkins also empha-

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The Weekly Newspaper of Geophysics

sizes the importance of rifting in the forma-tion of major Proterozoic ore deposit types.

Claciation was widespread at intervals during much of the Proterozoic, and both the evidence for glaciation (W. B. Harland) and the nature of the record (J. C. Crowell) are re-

Two papers are based on paleomagnetic data. J. D. A. Piper reexamines the case for a Proterozoic supercontinent, and D. J. Dunlop and L. D. Schutts present several examples illustrating how paleomagnetists decipher mag-netic overprints and use them to date and interpret tectonic events.

Readers who seek an overview of all major aspects of Proterozoic geology are likely to be disappointed. For example, papers are missing nn orogenic granitoid and volcanic rocks, and their significance in unraveling Proterozoic tectonic environments. This is a minor shortcoming, liowever, compared to the great value of the book. The authors and editors have succeeded in ennveying the distinctive flavor of the Proterozoic. The book is well produced and nearly free of printing errors. It should be on the book shelf of all those interested in the earth's early geologic Itistory.

P. K. Sims is with the U.S. Geological Survey,

Conservation of Water and Related Land Resources

Peier E. Black, Praeger, New York, xs + 209 pp., 1982, \$28,05.

Reviewed by Lynton K. Caldwell

The author was quite rlear about the purpose of this book and clearly achieved his intent. In his preface, the author states, "The purpose of this book is to acquaint the reader with a broad understanding of the ropirs relevant to the management of the nation's water and telated land resources." The bank is a product of the author's 20 years of work as a leacher, ronsultant, researcher, and student of watershed management and hydrology and has served as a text for a rourse entitled Soil and Water Conservation, which the author has taught at the State University of New York, College of Environmental Science and Forestry at Syracuse, New York, But it was also written with the intent to be of use "to informal students of water and land related resources on the national level as well." The objectives of Black's course at Syraruse and its larger purpose define the scope of the book whirli, again in the author's words, have been "(1) to acquaint students with principles of soil and water conservation; (2) to stimulate an appreciation for an integrated, comprehensive approach to land managem (3) to illustrate the influence of institutional

economir, and cultural forces on the practice of soil and water conservation; and (4) to provide information, methods, and techniques by which soil and water conservation measures are applied to land, as well as the basis for predicting and evaluating results. The book is written in straightforward nontechnical language and provides the reader with a set of references, a table of cases, a list of abbreviations, and an adequate index. It impresses this reviewer as a very well edited piece of work.

Second-class postage paid at Washington, D. C. and at additional mailing offices. Eos, Transactions, American Geophysical Union (ISSN 0096–3941) is published weekly by American Geophysical Union 2000 Florida Avenue, N.W. Washington, DC 20009

Cover. The photograph shows the tidal bore in one of the channels through the mud flats at Turnagain Arm, Alaska. It was taken at 1400 LT on September 4, 1983, from a lookout near milepost 95 on the Seward Highway (some 52 km up the arm from Auchorage). Low title at Anrhorage was -0.2 m at 1120 LT and high tide was 8.8 m at 1730 LT. The elevation of the lookoul was estimated to be about 100 m and its distance from the channel about 1 km. A 35 mm camera with a 120 D. F. Lynch, Tidal bores, Sci. Am., 247(4), 134-143, 1982) over most of the channel width, except near the banks where it is consistently breaking (F = 4.5-9.0) and along the banks where it is jetting forward (F > 9.0). Neglecting some nearshore interference effects, there appear to be three distinct wave trains following the leading wave: The central train has the greatest wavelength, and there are slep decreases to the trains on both sides. The far and near wave trains can be seen to have different wavelengths because of counting waves from the leading one, the counts for far-center-near are 6-5-7, 11-9-13, 15-13-19, 7-17-26, and 7-21-33. This shows, perhaps, that there is a cen-iral, steep-sided channel set into an otherwise gendy sloping bottom lopography.

The step up from the bottom of this rentral channel to the slope would be less on the far side than on the near side. It is suggested that the wave trains were created by the leading wave in a similar way that a vessel creates and carries with it a stern wave train whose wavelength is a function of vessel speed and water depot The lengths of the wave trains would be related to the group velocities of the waves. For a vessel in deep water the length of the wave train is (ideally) half the distance that the vessel has traveled (R. A. R. Tricker, Bores, Breakers, Waves and Wakes: An Introduction to the Study of Waves en Water, Elsevler, New York, 1965). Unfortunately, no measurements could be taken of the bottom topography the currents, or the characteristics of the bore, and so it was not possible to apply the equations for a tidal bore developed by Tricker. Students of waves would no doubt find it challenging to concurrendy take measurements of this tidal bore and to film it.

Acknowledgment: The opportunity to take photographs of the tidal bore oc-Institution of Marine Science at the University of Alaska, Fairbanks. (Photo contributed by George Cresswell, CSIRO Division of Oceanography, Hobart, Tasma-nia, 7001, Australia.)

The rontribution of this book to the literature of soil and water conservation appears to be precisely what its author intended. It is a very suitable book for introducing the reader to the basics of the subject. In seven chapters the author moves from consideration of the nistorical background of water and land use planning through a discussion of water law, he organizations at various governmental levels that are concerned with water resource policies, through a ronsideration of aspects of policy planning and pollution control, to a discussion of project evaluation. A sixth chapter, one of the longer, deals with projects and programs and is useful for a quick overview of how water projects rome into being, al-though emphasis is on the technical and procedural aspects of program development and only marginally on their political origins. Fi-nally, in a short final chapter the author comments on the conrept of "ronservation," annlyzing its varied uses since the term was adopted by Theodore Roosevelt. All but this last short chapter are followed by summnries, which are of assistance to readers with no previous background in the subject.

This is not a book to which professionals in

he field would turn to find the most recent nformation on the state of the art of land and water conservation or program evaluation. Nevertheless, it is up-to-date as of the time of its publication. It is a book written essentially for beginners, whether students in college or members of the general public, who would like to have some understanding of what the business of water managemer and conservation is all about.

Lynton K. Caldwell is with Advanced Studies in Science, Technology, and Public Policy, Indiana University, Bloomington.

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Deadline: April 1, 1985

Satellite Microwave Remote Sensing

Edited by T. D. Allen, Halsterl, New York, 526 рр., 1963.

Reviewed by George H. Born

This book is a collection of papers that presents results of the analysis by European scientisis of data from the Seasat mission. Seasat, launched in 1978, was the first satellite dedicated to microwave remote sensing of the oceans. The spacecruft carried a suite of four microware sensors, including a radar altimeter, a synthetic aperture radar, a windfield scatterometer, and a scanning multi-channel microwave radiometer. These nitcrowave sen-sors were supported by a visible and infrared

Seasal operated for just over 100 days be-fore its power system failed. In spite of its brief lifetime, the salellite returned a significant amount of unique data on the world's oreans. As evidenced by this book, the data are still under Intense investigation by scientists around the world.

A year prior to the launch of Seasat, a oup of European scientists submitted a joint proposal to NASA and NOAA for oceanographic, geodelie, and glaciological studies based on the use of Seasan data. proposal was accepted, and this group became known as the Season Users Group of Europe (SURGE).

Almost 4 years after Season's laituch, a meeting was held at the Royal Society, London, to present the results of the European research togethor with invited contributions from Cannda and the United States. The results of this meeting are effectively summa-rized in the thirty papers comprising this book. The lext is chiefly devoted to the analysls of Seasat data with a wrap-up paper de-scribing plans for the Europeun Space Agen-cy Remote Sensing Satellite, ERS-1. The 30 papers, each a chapter of the book,

include an overview of the Seasat mission, two general papers on data acquisition and processing, two papers dealing with the scat-terometer, 13 papers presenting results from the synthetic aperture radar, 10 papers related to the aldmeter, and two papers summanzing scanning microwave radiometer residus. Many of the papers deal with a comparison of Seasat measuroments of winds and waves to those measured by surface ships and

Results of the Seasat mission have been instrumental in the European Space Agency's

plans to fly the ERS-1 satellite, whose mission is described in the volume's final chapter. Also, Seasat results weighed heavily in NASA's planning for the TOPEX project to By a 2-em precision altimeter to map ocean circulation late in the decade. The U.S. Navy plans to By the GEOSAT spacecraft next spring carrying a Seasat-class altimeter to complete the job of high-resolution mapping of the marine genicl begun by Seasat. In 1989, the U.S. Navy plans to lly the Navy Remote Oceanographic Sensing System (N-

ROSS) carrying a suite ul sensors similar to

those aboard Scasat. Plans are underway in Japan and Canada to nibit, by the end of this decade, various microwave instruments derived from those flown on Seasal.

The papers in this edition are well written, and several present new results. The volume represents a significant contribution to the science of unicrowave remote sensing and is an excellent complement to the two special issues of the Journal of Geophysical Research (vol. 87(C5), April 30, 1982, and vol. 88(C3), February 28, 1983) which have been devoted to results of the Seasat mission. Several of the

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papers present analysis material murial in nature and not readily available elsewhere. With the dramatic increase in oceanographic microwave remote sensing scheduled for later in this decatle, this book takes on significant additional importance and represents a worthwhile addition to the library of anyone having an interest in remote sensing of the

George H. Born is with the Gentec for Space Research, The University of Texas at Austin, Austin.

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South Africa

of two referees by 26 October 1984 to the Deputy Registrar (Academic Staffing),

month's solary as well as normal University fringe benefits are payable.

ment but will be a distinct advantage. Two posts offered,

on structural and teclonic problems associated with basin development,

servatory).

Requirements are a Pl.D. in hand by the time of Requirements are a Pit. D. in hand by the time of appointment and an ability in carry out a research program. It is expected that some research support will be sought outside the Museum. Applications should include: (1) a curriculum viace, (2) names of three persons familiae with your work, and (3) a statement of research interests and specific projects to be carried out within the next five years.

These must be submitted by November 15, 1984

Chairman, Search Committee
Department of Mineral Sciences
American Museum of Natural History
New York, NY 10024
An equal opportunity (M/F/H) affirmative action

required. The sterest in cauditate will be expected to develup a research program in some aspect of applied geophysics and teach courses in geophysics, expliration geophysics, and in his or her specialty. The Department has LI full-time faculty. In addition, two faculty from the Physirs Department participate in our geophysics program. Complete geophysical instrumentation, including a seismograph stations and rick mechanics lab, are available.

physical instrumentation, including a seismograph statius and rick mechanics lab, are available.

Interested persons should send resume, statement of research interests, official transcripts, and three leners of reference to Charles M. Onasch, Chairman, Search Committee, Department of Gedogy, Bowling Green State University, Howling Green, Ohio 43403. The closing date is November 30, 1984. We will be inneeviewing at GSA in Renn.

BUSU is an equal opportunity/allirmative action enougher.

Structural Geology and Tectoules. The Department of Georgicules at the University of Arizona i pleased to amounte a new position in the general area of structural geology and tectorics. We seek a creative a lemit with an interest in the structure and evolution of the earth's crust, someone who can bring new approaches to crucial problems in the evolution of oragenic systems combined with more evolution of oragenic systems combined with more evolutional and neclect models. bring new approaches to crucial problems in the evolution of oragenic systems combined with more traditional and modern methods. Candidates should expect to teach undergraduate structural geology, develop new graduate romes material to complement and extend existing programs, advise graduate research, and carry out an artive research program in their area of special interest. The academic level and salary will be dependent upon the experience and qualifications of the successful candidate. The position will be available Fall, 1985.

APPLICATION DEADLINE: Navember 1, 1984.

Applicants should send puriculum vica, bibliogra-

Applicants should send rurriculum via, bibliography, statement of research interests, and the numes
of four professional references to: George H. Javis,
Department Head, Department of Geosciences, The
University of Arizona, Turson, AZ 85721.
The University of Arizona is an equal opportunitylaffirmative action employer.

Paleoblology and Quaternary Paleoecology Posl-dons/University of Teonessee. The Department of Ceological Sciences, UT Knoxville (main cam-pus), invites applications for two tenure track teach-ing and research positions at the Assistam Professor

level.

(1) Poleobiologist—Applicants should have research interests in paleobotany, micrupaleontology, or invertebrate paleontology.

(2) Qualernary Paleoteologist—Applicants should have research interest in terrestrial floras and/or paleoclimatelogy. This is a 34-time appointment made jointly with the Craduate Program in Ecology.

Both positions will be effective September 1, 1983, and applications are due by January 6, 1985. Ph.D.'s are required. Send resume, transcripts, and names of three referees to: Search Commistee, Deportment of Ceological Sciences, University of Tennessee, Knoxville, TN 37996.

UTK is an EEO/Title IX/Section 504 employer.

College of Geosciences/University of Oldahoma.

Applications and nominations are invited for the position of firector of the School of Geology and Geophysics. The Director is expected to have a Ph.D. or equivalent, a strong, ongoing research program and administrative experience; industrial experience helpful; field of geological specialization open in beside table. 1985. experience helpful; field of geological specialization open; to begin July 1, 1985; salary to be negotiated. In 1986, the Scribool will move into the new 300,000 sq. ft. Energy Center along with other elements of the College of Geosciences; the Oklahoma Geology Survey; and the School of Petroleum and Geological Engineering and the Scribool of Chemical Engineering and Materials Sciences, both from the College of Engineering.

Applications with curiculum vitae, names and addresses of three references, and/or nominations should be tent to:

addreses of three references, and/or nominations should be sent in:
Francis G. Stehli, Dean
College of Geosclences
University of Oklahoma
801 Elm Street, Room 438C
Norman, Ot. 73019.
Consideration of applications will begin January

1985.
The University of Okishonia is an Equal Oppor-unity/Affirmative Action Employer.

Posidoctoral Position/Naval Posigraduate School.
The Orean Turbulence Laboratory has available a postdoctoral position for a person interested in the analysis and interpretation of oceanic turbulence datus. The tenure is foc one or two years. The succeasful candidate should have a Ph.D. in physical oceanography and although experience with turbulence data is preferrable it is not essential. The opportunity for involvement in data gathering expeditions is also available. Resumes can be sent to Dr. R.G. Luerk, Code 68 Ly. Naval Postgraduate School, Monterey, CA 93945.

AAPEOK.

Department of Geosciences/University of Houston. Department of Geosciences/University of Houston. The Department of Geosciences has permission to fire at least one geophysicist to complemens the 16 members of our faculty (3 in Geophysics). This is a tenure track position with a starting date of August, 1985. We are particularly interested in talking with individuals with strong backgrounds to theoretical and experimental seismology. Salary and rank will be determined un an individual basis. Applicants should submit: (1) a curriculum vita; [2] a brief statement unliming research interests; (3) a brief for extensive rommittee activities, and working with the managers of the various research programs. Under supervision of the President, represents the corporation as necessary in dealing with member institutions, funding ageincies and conteacturs in administering large scientific programs. The corporation anticipates a level of research exceeding \$20 million annually in five years, with a permanent office staff of up to ten. Candidates must be able to work independently, with little staff support in the first year, and have sufficient breadsh and experience to establish an efficient, functioning corporate office. Applirants should submit resumes and names of at least three references to: IRIS, Inc., Department ED, 2000 Floritla Avenue, N.W., Washington, D.C. 20009. statement unilining research interests; t31 a brief statement outlining teaching interests; t4) three let-ters of recommendation; (5) a copy of graduate

Juhn C. Burler Juhn G. Butter
Geosciences
University of Houston, University Fark
Houston, Texas 77004.
Several of my colleagues and I will be at the GSA
meetings in Renu and would like to talk with potential applicants.
The University of Houston is an equal opportu-

Olrector: Atmospheric Stlences Research Centerl Blate University of New York at Albany. The State University of New York at Albany, invites nominations and applications for the position of Director of the Atmospheric Sciences Research Center. The main purposes of the university-wide center, located adjacent to the main campus of the State University of New York at Albany are, also promote and encourage programs of research in basic and applied sciences, especially as these relate to unit environment and bit to currounage the indiest possible paricipation in these research activities by faculty and students throughout the university and in all appropriate industrial, governmental, and educational groups.

Qualifications: Scientists of international reponation having a record of publications relating to atmospheric problems; involvement with research to own field and interest in research being conducted by colleagues; proven ability to administrative skills;

field and interest in research being conflicted by colleagues; proven ability in administrative skills; desire and aptitude to communicate about science with students and the general public; success its securing funding for research from governmental, industrial, and other agencies.

Inquiries, nominations, or applications with supporting resumes should be directed to John Shumaker, Vice Prevident for Research and Educational Heyelopment, State University of New York at Albany, Albany, NV 19222. Application deadline: November 15, 1984. SUNVA is an Allimative Action/Equal Opposite

nity employer.

Applirations from minority persons, women, lamilicapped persons and Viet Nam era veterans are especially welcome.

Structural Geology/Duke University. The De-partment of Geology invites applications for a sen-tor-level tenured faculty position in structural geolo-gy. We are seeking an individual with a provent re-search record and international recognition in his her field. The Heparment has active research pro-grams in geophysics, sedhuentology, geochemiste, igneous petrology, carbonate petrology, maines ology and paleomtology; graduate programs for igneous periology, carbonate periology, marine ge-ology and paleontology; graduate programs for both the MS and Ph.D. degrees are offered. Appli-rants should send a run irollom vide and mones and addresses of six references. The position is to be filled by September, 1985. Closing date for applica-tions and nominations is Hereinder 31, 1984. Appli-cations, mandrations and beprivices should be direc-ted to Chabrinan, Search Cummittee, Beparament of Geology, Duke University, PO Box 6729 College Station, Ducham, NC 27708. Duke University is an orneal amount mitwaffirma-

Civil Engineeeing. The University of Notre Dame is seeking applications for a tenure track Assistant or Associate Professor position in its Department of Civil Engineering, Applicants should have an earned Ph.D. in Civil Engineering of air appropriately allied discipline; the initiative, scholarship, and creativity to direct a funded research program encompassing M.S. and Ph.D. students and a demonstrated ability for quality tearning at the graduate and undergraduate levels. The successful candidate will strengthen the Department in at least one of the following areas: water quality, by drology, environmental chemistry, soil mechanics, geotechnical engineering, design or structural analysis. Appointment will begin with the Fall 1985 semester or other agreed upon date. Send resume and names of three references to: William C. Gray, Chairman, Department of Civil Engineering, University of Norre Dame, Notre Dame, IN 465-56.

Affirmative Action/Equal Opportunity Employer.

University of Utahr Structual Geology/Teotonics/
Tectonophysics. The Department of Geology and Geophysics at the University of Utahr seeks applications for a tenure track position in structural geology, tectonics or tectonophysics. It is anticipated that this position will be filled at the assistant professor level, but applications by more senior persont vill be considered. The position requires a Ph.D. with emphasis in structural geology, regional tectonics of tectonophysics. The new faculty member will have the opportunity to teach in the area of his or her specialty and may also be assigned introductory level courses. The successful candidate will be expected to establish a vigorous research program involving graduate students. The person who fills thit position will join an active program in structural geology and tectonics that includes both field projects and integrated geology/geophysics ans mechanical fluid chemistry studies of structures in the western Cordillers. There is an excellent opportunity to collaborate with other faculty in structural geology. A vita, copies of publications, names of three persons that may provide references, and a letter outiling the candidate's research and teathing interests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests should be sent to Dr. Williams P. Nash, Chair terests sh

The University of Utah is an equal opportunity affirmative action employer.

University of California, Santa Darbara. Tenure trark position in geography-oceanography, available july 1, 1985. Salary and rank are dependent upon qualifications; however, preference will be given at the Assistant Professor level. The Geography Decreases seeks applicated with backgrounds in pariment seeks applirants with backgrounds in Physical Ocemography aud/or Air/Sea Interaction with an interest in Remote Sensing. Applirants must have a Ph.D., substantial qualifications to marine research, and a strong commitment to teaching and research. Submit resume and names of three referees to: Chairman, Search Committee: Department of Ceography: University of California; Santa Barbara, CA 93106. Closing date: December 10, 1984, Equal Opportunity/Allit mative Artion Employer. computer systems. Send resumes to:
Don Sawyer

Sigma Data Servicer Corp., a M/A-COM Co. Code 639 NSSIK: Goddard Space Flight Center Greenbelt, MD 20771.

Yale University/Solid Earth Geophysics is solicining applications for a junior faculty position in solid-earth geophysics to begin in the arademic year 1985–1986. Areas of interest to the department include selsmology, exploration geophysics, mechanical and physical properties of rurks and minerals, geomagnetism, actionophysics, and geodesy. Curriculum vice, publications and the manies of three or more referees should be sent by December 1, 1984 to Karl K. Turckian, Chairman, Department of Geology and Geophysics, Yale University, Box 6666, New Haven, CT 06511. Yale University is an equal opportunity/affirma-tive action employer and encourages applications from all qualified scientists.

High Altitude Disservatory Scientific Vieltor Program/NGAR. Srientifir visitor appointments at the High Akitude Observatory are available for new and established Ph.D's for up to une year 10 carry our research in solar physics, solar terrestrial physical physics. and established Ph.LDs for up to une year to carry our retearch in solar physics, solar-terrestrial phys-ics, and related subjects. Applicants should provide a curriculum vitae, including education, work expe-rience, publications, the names of three scientists fa-miliar with their work, and a statement of their re-January 1985 and they should be sent to: The HAO Visitor Committee, High Altitude Discretary, National Center Aunospheric Research, P.O. Box 3000, Boulder, Colucado 80307-3000,

ent seeks applirants with backg

VCAR is an Equal Opportunity/Affirmative Ac-

Craduate Assistantiships in Physics, Space Physics and Atmospheric Sciences. Assistantiships are available for grailuate sindents seeking M.S. and Ph.D. degrees in Space Physics, Atmospheric Sciences or Physics, at the University of Alaska. Research areas include both Experimental and Theoretical studies in Space Plasma Physics, Solar Physics, Computational Physics, Radio Physics, Atomic and Molecular Specthoscopy, Atmospheric Optics, Atmospheric Dynanics, Atmospheric Chemistry, Physical Meteorology and Clinatology. Thesis research is conducted through the Goughtysical Institute. The stipend is \$19.000 the Scientists. riyatal ateleprology and Clinatology. Thesis research is conducted through the Geophysical Institute. The stipend is \$12,000 to \$15,000 per year depending on eredentials. Students with B.S. riegrees in Physics, Atmospheric Sciences, Electrical or Mechanical Engineering are encouraged to apply. For more information, write to Professor J.R. Kam, Head, Department of Space Physics and Atmospheric Sciences, or Professor C. Styce, Head, Hepartment of Physics, University of Alaska, Failbanks, Alaska 99701 or call 907-474-7513.

Environmental Chemist. The Illinois State Water Suvey, Annospheric Chemistry Section, at the Dui-versity of Illinois, seeks applicants for research on sphares margh. airhorne metallic and organic hazardon wastes (HW), M.S. with reveateli experience, or Ph.H. AptHWL M.S. with research experience, or Ph.H. Applicants should have atrong preparation in organic chemistry, skills in atmospheric sampling, lab procedures, data analysis, and oral and winter presentation of results, Successful cambidate will review states of HW indineration in Illinois, review outrent methods for aithorne HW sampling and analysis, develop or adapt sampling methods, and carry out atmospheric measurements of HW concentrations. Good opportunity for applicant seeking to develop a research program in airhorne HW. Sabary low 20% to low 30%, depending on spallifications. Glosing date: October 31, 1984. Scool resume to Hr. Dunald Gaty, ISWS, I/O Hox 6050, Champaign, II, B1820. Gatz, ISWS, PO Hox 5050, Champaign, H. 61820, The University of Illimit is an Affornative Ac-tion/Equal Opparationly Employer.

Hydrogeologist/Illinois State Geological Survey.
Positions are available for research staff in study problems bridging hozardints and radioactive waste disposal and grantudwater resontce evaluation. Applicants should pussess an advanced degree in hydrogeology or related field and have strong enminication skills. Send a letter of application, resume, list of three references and list of publications to: Marilyn Reberon, Persiannel Ollice, Illinois State Geological Survey, #15 E. Peabudy Drive, Champaigo, H. O 1820 by October S1, 1984.

The Illinois State Geological Survey is an equal opportunity/alignmative action employer.

Scientist. The National Space Science Data Center (NSSDG), at Goddlard Space Flight Center in seeking an experienced scientist to work with the NSSDC iomospheric data archive, and to acquire additional data and dorumentation at appropriate. Applicants must have a Ph. D. and should have at least tive years experience in the compilation and use of multiple iomospheric datasets. Applicant must have a broad overview of available tomospheric datasets. data sources, and must be experienced in the use of

Postdoctoral Fellow/Columbia University. The Aldridge Laboratory of Applied Geophysics of Laboratory of Applied Geophysics of Laboratoral Color post-doctoral fellow position in partiripate in challenging research in wave propagation in the Mugnetospere. A PhO in geophysics, physics or applied mathematics is required.

A Ph.O in geophysics, physics or applied mathems is required.

Applicants should demonstrate a strong background in wave theory and numerical methods. Send curriculum vitae, his of publications, research increasts and names of three references by November 15, 1984 to:

Prof. Philip M. Carrion 828 B Multd Building Columbia University 820 West 120th Street New York City, NY 10ne7.

Columbia University is an equal prantitum of the columbia Col

Columbia University is an equal opports

R&D Software Support foe Deeanography, Hydrography, Navigation and Gartography/Selence Bystems & Applicationa, fnc. (S&Af). SSAI provides arientific data aquinitinu, data management, modeling, and analysis support to NASA/NOAA and the Navy in the metropolitan Washington, Dr. area. For NOAA's hydrography survey and marine charing needs, SSAI is anticipating openings for algorithm development, software design, development tening, documentation and maintenance areas. Applicants must have BS, MS and Platt degrees and estensive experience in structured programming on micro/mini and mainframe computers. Please send ymar remnne with salary history and references to:

Science Systems & Applications, Inc. 10210 Greenbelt Road, Ste 610 Seabrook, MH 20706.

Post Ooctoral Fellow in Ceophysical Fluid Dynamies (C.F.O.)University of Southern California.

To organize and perform experiments, analyze data and present the results in trial and written form for the problem of flow over topography in retaining-stratified fluid systems. Ph.D. in entable Engineering or scientific discipline required, Knowledge of nucleo-processor hased data acquisition systems essential. Position available municipately for a two-year period. Salary continensuate with experience. A complete resume and at least three letters of recommendation should be cent to Prob. J. Maxwoulty, 1941; 430. Bepartiment of Mechanical Engineering, University of Southern California. Los Angeles, CA 90009-1452.

Saint Louis University. The Department of Lattle and Atmospheric Sciences invites applications for a tempretract, assistant molestor position in geophysics effective for the full of 1985. We seek an individual with broad interents who will complement active research programs in seismology and earth structure. Preference will be given to and other who can teach existing contract in dance to adulate who can teach existing contract in dance to adulate programs. nuc. Preference will be given no andidate who can teach existing courses in plane rectonics, geomagnetism and/or geolecuticiti. The successful candidate must have a Pluff, degree and will be expected to malurality an active research program, to teach geophysics courses at the undergradinate and graduate levels, and to supervise graduate student research. The application deadline is January 15, 1985, Applications should send a curriculum viace, a statement of vescoarch and seaching interest and the trainer of

of recearch and reaching interest and the maines of 4 professional references to:

Dr. Brian J. Mitchell, Chairman Department of Earth and Autospherir Sciences Saim Louis University

PO Box R099—Larlede Station
St. Louis MO 68150 Saint Louis University is an affirmative action?

Soil Physics/Ag Engineering. Asst./Assuc. profes-sur for full time, returne track, teaching and re-search position at the University of Arizona. Re-search responsibilities relate to the rue of experi-mental terhniques, immunicutation, micro-

OCEANOGRAPHER

SALARY \$30,549-\$39,711

The Remote Sensing Branch of the Naval Ocean Research and

Development Activity (NORDA) located at National Space Technology

Laboratories, Bay St. Louis, MS. is seeking qualified applicants for a

physical oceanographer with experience and interest in research

studies of ocean dynamics via satellite altimetry. Duties will include

providing oceanographic interpretation of the GEOSTAT mesoscale product; aid in obtaining subject procedures for the production of

mesoscale analysis; assist in the GEOSTAT Ocean Application Program

(GOAP) through the coordination of ongoing objective and subjective

oceanographic guidance for software implementation; develop

and technical briefings. Applicants must have, as a minimum, a

bachelor's degree in oceanography or related disciplines, and a

education, or a combination of both. Qualified applicants should

Contact the Naval Ocean Research and Development Activity, NSTL,

MS, 39529. ATTN: Code 140 or call (601) 688-4640 for application

minimum of three years of professional experience or graduate

methods for the production of Expanded Ocean Thermai Structure

(EOTS) bogus files from altimeter derived topography; responsible for

reporting results through published technical reports, Journal papers

data system development and interfacing with programmers to provide

include inicio-computer interfacing and measurement techniques in soil and water. Ph.D. in agricultural engineering, will physica or related hield with background in instrumentation, micro-computer interfacing and soil and water engineering or physics. Send returne, transmipts, his of publications and nature of these to five references to: H.L. Italia, Search Committee Chairman, Dept. of Soils, Water and Engineering, Univ. of Arizona, Turtum, AZ 85721. Position upon until January 15, 1985 or mutil a suitable candidate in identified.

Hydrogeologist or Hydrologist. The Kamas Genlogical Survey, a division of 1 be University of Kansas, solicits applications for a hydrogeologist or hydrobigin. Permanent, full-time position subject to
annual review. Salary Range: \$20,400—\$30,001 pervear, depending on qualifirations. Requite of qualifirations: Master's degree in hydrogeology or hydrology. Ability in develop, cumulart, and participate in
hydrogeologic and hydrologic studies, evaluating
ground-water resources in Kansas, including held
work as needed. Ph.D. in hydrogeology or hydrohygy and/or publication records or proven experience
preferred.

Freedom to ronduct research within the framework of the KGS Geolydrology Section's programs
and impoor of a university environment. Opportunnity for graduate study or tearbing; and fully funded research opportunities in excellent research facilities.

ities.
Comact Pergunnel Manager, Kansas Geological Survey, 1930 (Lounant Avenue, Campus West, The University of Kansas, Lawrence, Kansas 660-14 (Ph. 913-864-3905) for bill position descriptum, or so ap-ply, send remme, college transcripts and his of pubply, send remaine, college transcripts and his of published research. Applications received on or before December 28, 1984 will be considered. An equal opportunity/affirmative action employ

Manager, Research Computer Facility. The University of Oklahoma is building for a person to manage a recently purchased VAX 11/785 computing facility dedicated to research in the Geneticines. Hardware and Software are designed for image processing, seismic reflection that processing, and graphical display of geological, geographical and geodoxical data.

geophysical data. In addition to the 11/785 with 8mh of CPU mem-In addition to the 11/785 with 8mb of CPU memory, the system includes an array processor, five tape drives, five disk drives, a line printer, a 36" electrostatic planter, and two high resolution graphics work stations with a digitizing locard. The image processing bardware includes a Gould-DeAnra 119500 processor with 16 image memory planes, real time disk memory and three high resolution could maniture.

real line disk memory and time ingui resonation color monitors.

The person selected must have at least a BS degree in science, math, engineering or related lield; two years programming esperience including FOR-TRAN; educational or computing esperience in solid earth geophysics in meteorology. Experience with the NAS ASSES are appeared as well as amorty.

il carli geophysics in ineteorology. Experience with the VAX VAIS operating system as well as supervi-sori experience are ilestical. Salary is regorable. People interested in the posi-tion should send a resume, copies of academic tran-scripts, and the names, addresses and telephone numbers of three references in: John Wickham, Director Salarah at London, M. Complexions

School of Geology & Geophysics University of Dillahuma Norman, CK 78019 Applications than be received by November 2.

Solid Earth Geophyslelst. Faculty position in the Graduate Repartment of Scrippy Invitation of Oceanographs and the Insurance of two physics and Planeary Physics. Applications are invited for a neutral feathy position in the held of solid karding applysics, inclining his theoretical and observational aspects. The position will involve graduate student research. Qualifications include a Ph.D. in one of the science and demonstrated excellence and independence in research. Weight will be given to evidence of superior teaching ability. An appointment at the Assistant Professor level is envisaged but qualified applicants at all levels will be consultered. Associate or professorial level caudidates must demonstrate a strong research record in their specialty; assistant level caudidates will be expected to show evidence of their potential by means of a publication record appropriate for thicir experience and in their leners of recommendation. Salary commensariate with qualifications and experience. Send letter of application, rurriculum vitae, including research interests, and the names of three references to: Chairman, Graduate Department A-008, Stripps Institution of Oceanography, University of California, San Diego, La Joffa, CA 92093. Respunses must be received by Nuvember 30, 1984.

Faculty Positions in Meteorology. Applications are invited for two tenure trark or tenured faculty positions in the Division of Meteorology and Physical Oceanography in the Rosentiel School of Manne and Amospheric Science of the University of Miami. The rank and salary will be negotiated depending upon qualifications. Applirants must hold a Ph.D. In atmispheric science or closely related fields. We are especially seeking applications from those interested in 11 thinate dynomics, including observational studies of all aspects of the general circulation and its interannual variability, and 21 metastale metastales, with emphasis on studies of regional dynamics of the marine environment, although qualified candidates in other areas are also encouraged to apply. The successful candidates will be free to pursue active research programs with a limited amount of graduate-level leaching. Applicants should submit curriculum viace and the names of amount of graduate-level leaching. Applicants should submit curriculum viace and the names of three references to: Or. Eric J. Pitcher, Chairman of Search Committee, Rosenstlel School of Marrine and Atmospheric Science, University of Miami, 4600 Rickenbarker Causeway, Miami, Fla. 33149.

The University of Miami is a private, bidependent, international university and is an equal opportunity/affirmative action employee.

Department of Geology/Indiana University. The Department of Geology at Indiana University is seeking persons skilled in the application of playsics to the solution of geologic problems. Special consideration will be given to applicants with demonstrated expertise and potential for nutstanding resent in one of the following areas:

(a) Solid Earth Geophysics—exploration geophysics, rock mechanics or seismology.

(b) Mineral Physics—with special interest in the implications of changing mineral properties no geologic processes.

(b) Militeral Physics—with special interests in the implications of changing mineral properties no geologic processes.

(c) Hydrodynamics—groundwater meritainies and the dynamics of sedimentary processes.

Indiana University has aggressive programs of research and tearthing related to the above arens which it wishes to significantly expand. Successful applicants will be expected to assist in the expansion of these programs through interaction with current isculpy as well as through interaction of new programs of interdisciplinary research.

We expect that appointments will be made at the assistant professor fevel; however senior scientists with superior records of success in 'publication and attraction of research funding also will be considered for a higher level. One appointment will be

EXPERIMENTAL PHYSICIST The MIT Center for Space Roseach seeke individual with background in space plasma physics or tolated lield to assist in design, davelopment, evaluation and construction of instrumente lot a variety of space missions Okeel experience in the design and construction of balloon, rocket or salelille-borne instrumentation is required. Includes opportunity for

> ilon depending on the interests of the applicant. Please send resume including list of mobile there to: br. H.E. Bridge, c/o MiT Personnei Office, 77 Massachusetts Avenue, E19-238, Gambridge, MA 02139.

pari-time data enalysis and interpreta-

made for the 1984-85 academic year. We autimaking two more appointments in successive veirs. We will be interviewing at the Geological Sudety of America meeting in Reno. Nevatla, November 5—8, 1984 and the American Geophysical Union Edit 84 and the American Geophysical Union Fall ing in San Francisco, California, December 3–

7, 198-f.
Inquiries and format letters of application, including results, should be sent to:

N. Gary Lane
Chairman
Department of Geology
Indiana University
Bloomington, tN 47-105.
Imitana University in an alluments exticu/equal outportmits emiliar.

University of Wyoming/Department of Ceology and Ceophysics. The Lupartment of Licology and Ceophysics on mages applications from markens interested in pursuing graduate research in the tickly of igneous and measurorphic perrology and geodicinistry. Convent research topics, invoking field and laboratory studies, metalic; island are and continental vidi aous, getrogenesis of grantic and anorthostic rocks, evolution of the Archeon crust, petrogenesis of mylomic rocks, and geodicinionory and geodiciniony a applied to the evolution of progenic terrancs. Facilities include an analytical georhemical lab for whole-tork and trace element analysis, a tully anomated UAMEA A microprobe, two [OEL scanning electron microwoles, a thermal ionization mass specific motors for

microprobe, two IOEL scanning electron micro-wopes, a thermal ionization mass spectrometer for analyzing Rb-Sr. Sm-Net, and UCI h-Pi reoroges, a nicrohermometry lab, and an experimental petrol-ogy lab. Applicanty should contart: Petrology/Lean hermyty Program Denorment of Geology and Leonbysics Perarining of Geology and Scoplysics Per line 2006, University Station University of Wyoning Laranic, WY 82074

Research Associate/University of Maryland. The Space Pixes & Group of the Department of Physics and Astronomy has an opening for a Research Associate for an initial one-tear period with high like fillicoid of extension. The position involves research on emergen, particles of solar and interplanetary origin. Applicants should possess a Pa Wirra relevant area of physics of astrophysics, relevant research experience is highly destrable. Impuries and applications should be addressed to Prof. Identify M. Maryland. College Park, MD 20742. Applicants should send a cita methoding complete bibliography and a description of research experience, and should arrange for the sending of at least three letters of reference.

The University of Maryland ivan equal opportunity/affirmative action employer.

POSITIONS WANTEO

Geologist/Geochemist. 33, M.A., Ph.O. 1983. Spe-cializing in low temperature geochemistry and geo-chronology with extensive experience in Rb-Sr mass spectrometry. Several publications. Seeks indostry, academir research, or government position. Box 027, American Geophysical Uniun, 2000 Florida Av-enue N.W., Washington, DC 20009.

Travel Funds to Fall Meeting Available to Foreign **Graduate Students**

Grants of up to \$250 are avallable lo loreign graduale sludanta sludying in Tha U.S. for travel to the AGU Fall Meeting, Decamber 3-7 in San

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<u>Meetinas</u>

Announcements

Water Demand

August 11-18, 1985 Water Demand: Sharing a Limited Resurree—The 21st Annual Conference and Symposium of the American Water Resources Association, Tucson, Ariz. (Yoram Gorchin, Greenharae & O'Mara, Inc., 9001 Edmonston Ril., Greenbelt, MD 20770; telephone: 301-982-2846.)

The deadline for abstracts, which should be submitted in triplicate and should not exceed 200 words, is November 15, 1984.

Papers should discuss, evaluate, or present new and emerging technologies for and approaches to the management of water resources in light of the scarcity and limited availability of usable water in sections of the United States and many other parts of the world. The papers may relate in general application or to case studies of specific geographic areas. Among the topics to be adfressed in conference sessions are strategic planning contributions to water resources problems; the identification, development, and management of new sources of water; the optimization of water allocation; water rights Impact on water use; the conjunctive use of ground- and surface water, i.e., agricultural, domestic, and infustrial; and the economic aspects of water utilization.

Water and Space

August 18-24, 1985 International Workshop on Hydrological Applications of Space Technology, Cocoa Beach, Fla. WMO, IAHS. (A. Ivan Jalmson, 7474 Upham Court, Arvada, CO 80003.1

The deadline for abstracts [400-600 words] Is November 30, 1984.

The workshop program will emphasize of-fered and invited oral or poster paper related to the input of remute sensing and remote data transmission to hydrologic models and geographic information systems. Field trips to the National Aeronautics and Space Administration's J. F. Kennedy Space Center and other points of interest are planned. An exhibit and demonstration of pertinent equipment, systems, and programs will be available, as will a display of related books and period-

Meeting Report

* 1

Incoherent Scatter Radar User Workshop

The incoherent scatter radar technique has developed over the years into one of the most powerful tools for investigating physical pro-

cesses in the upper atmosphere. The National Science Foundation (NSF) now supports a chain of four incoherent scatter facilities at Sombrestromfjord (Greenland), Millstone Hill (Massachusetts), Arecibo (Puerm Rico), and Jicamarea [PERU]. Six European nations support the EISCAT facility in northern Scandinavia, and France also has a radar at St. Sanio. Recently, the organizations reprasible for each of the six radars agreed to participate in a centralized data base being established at the National Center for Atmospheric Research (NCAR) tu make their data more readily accessible to the scientific community

The distribution of cadars enables a number of scientific problems to be addressed involving global-scale phenomena. To facilitate the planning and development of crurdinated studies using the radars, a workshop was held at SRI International in Arlington, nn February 22-24, 1984. The workship, attended by 50 scientists, was sponsored by the NCAR data base and by the Incoherent Scatter Working Group (ISWG) of the International Scientific Radio Union (URSI). Thanks to the careful preparations by the involved scientists, the workshop was very productive. It is likely to become an annual event.

Because the NCAR incoherent scatter data

base la expected in became a major vehicle

for developing coordinated studies, the first marning session was spent reviewing a draft report, edited by Vincent Wickwar of SRI International, describing the establishment and operation of the data base. This report originated from an earlier workship held at NCAR In 1982, and has been elaborated in nemporate the agreements and recommendatinus of the scientific community made since then concerning operation of the data base. Data from recent inroherent scatter observing periods are expected to become available this summer, with older data being processed and entered into the data base over the next few years. Resenrchers interested in using these data are encouraged in contact Art Richmund (address and phone below) to help ensore that data of greatest interest become

available un a convenient schedule. The equeration of the incoherent scatter radars has now become sufficiently routine that researchers can carry out experiments without having intimate knowledge of the equipment. Incleed, all interested researchers are strongly encouraged in propose scientifically sound experiments that will make good use of the radars. For the workshop, a repre-sentative from each radar prepared material describing its capabilities and the procedure for scheduling radar time. This material is being edited into a user guide by Richard Behnke of the NSF.

Most of the workshop was devoted to planning coordinated experiments for the next year and a half. Twelve studies were developed on topics in thermospheric, ionospheric, and magnetospheric physics. They were summarized on the final day in a presentation by Michael Kelley of Cornell University and are described briefly below. Based on these proposed studies, plans for the 1984 and 1985

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This program is a living memorial to Lloyd Berkner, whose devotion to the encouragement of young scientists and stimulation of international activities will long be remembered.

AGU members are encouraged to send names ond addresses of such individuals to AGU so that applications and details can be forwarded. Applications and further details are available from:

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coordinated incoherent scatter observation schedules were developed in a session chaired by the URSI ISWG chairman, Murray Baron f EISCAT.

Thermospheric structure and dynamics was a topic of considerable interest at the workshop. The studies discussed concentrate on understanding and great for understanding and quantifying the complex global thermospheric response to variable energy inputs from the mesosphere below and from the sun and magnetosphere above. One major project, called the Global Thermospheric Mapping Study will look at this prohlem by collecting and analyzing simultaneous measurements from all six incoherent scatter radars, as well as from available satellites and from the international networks of Fabry-Perot interferometers, meteor-wind radars. MST radars, and partial-reflection-drift radars. Data will be available from all altitudes between 80 and 500 km, over a broad range of latitudes. Two observing periods of 3 days each around the solstices (June 26–28, 1984, and January 15-17, 1985) are currently planned. To incorporate the diverse data into a coherent global picture, and in order to in-terpret the variability in terms of the different energy sources, a combination of empirical and theoretical global models will be used to study effects related to global thermospheric and mesospheric circulation, annospheric tides, thermospheric and ionospheric structure, and ionospheric wind dynamos. The study is being coordinated by W. L. Oliver and J. E. Salah of MIT Haystack Obser-

Besides the Global Thermospheric Mapping Study, other projects were planned at the workshop for studying thermospheric dynamics under different conditions. For example, a campaign during the equinox of September 1984 is designed to examine the causes of reversals in north-south thermospheric circulation at mid-latitudes, as well as to detect wind dynamo effects associated with the circulation changes. A campaign is being planned to look for wind and temperature changes at Millstone Hill and Arecibo during the annular solar eclipse of May 30, 1984, and to compare thse with model predictions. Previous data acquired from the mid-latitude radars will be used to study solar cycle variations of thermospheric tides. Another proposed project intends to examine the sources and global propagation of gravity waves in

storms (CISMOS). One 3-day campaign involving all six radars was carried ont in January 1984, and another is planned for an equinox period in 1985. Several other types of measurements are also being used in the study. A variety of satellites are observing the particle and field environment of the earth; coherent-scatter radars are measuring motions of ionospheric irregularities; magnetoni eter and riometer chains are giving data un ionospheric currents and energetic particle precipitation; and a chain of Fabry-Perot interfernmeters from Greenland to Brazil is providing information on the neutral thermospheric behavior. The primary objective is to understand how ionosphereic electric fields behave at latitudes ranging from the polar cap to the magnetic equator during magnetospheric substorm events and luny the fields are interrelated with other magnetospheric and thermospheric phenomena. In addition to the GISMOS campaigns, other coordinated electrodynamic abservations are plonned at the high-latitude incoherent-scatier stations to study high-latitude convection and magnetuspheric cleft phenumena. A special experiment to try to measure large electric helds in the vicinity of the plasmapause and to relate these to electric lield behavior at other latitudes was also proposed. Other coordinated studies developed at the

lonospheric electrodynamics was also a ma-

jor topic at the workshop. Examination of

global electric fields at relatively high time

Inroherent Scatter Measurements of Sub-

esolution is part of a project called Global

workshop concern the photochemistry of the 85-100 km height region at different latitudes and ionosphere-protonosphere cou-pling at low latitudes, using simultaneous observations at Arcellio and Jicamarca, Stadics involving only a single radar were ant a primary focus of this workshop; however, a large number of single-radar experiments will continue to be carried out in the funire

as in the past. For further information on the meeting, including copies of the data base report, the user guide, the coordinated project outlines, and the URSI ISWC minutes, contact A. D. Richmond at NCAR, P.O. Binx 3000, Boulder, CO 80307 (telephone: 303-407-1468).

This meeting report was contributed by A.D. Richmond, NCAR, Boulder, Colo.

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John Adam Fleming Medai. Awarded for originsi resestch and technical

Waiter H. Bueher Medai. Given for original contributions to the basic

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occan; who is a leader in scientific ocean engineering, technology, and

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James B. Macelwane Award. Up to three swards are given each year for

significant contributions to the geophysical sciences by a young scientist of

outstanding ability. Recipients must be less than 36 years old on November 1

Send letters of nomination outlining significant contributions and

curricula vitae directly to the appropriate committee chairman.

of the year preceding presentation of the award.

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leadership in geomagnetism, atmospheric electricity, aeronomy, and

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